

Claims

What is claimed is:

1. An integrated circuit comprising:

a conductor for generating a magnetic field, the conductor having first and second
5 surfaces and sides;

a magnetic liner lining at least the sides and second surface of the conductor; and
the magnetic liner having super-paramagnetic properties.

2. The integrated circuit of claim 1 wherein the liner comprises a super-paramagnet with high susceptibility.

10 3. The integrated circuit of claim 1, wherein the liner comprises a ferromagnet film with a microstructure having non-exchanged coupled micro domains whose size is so small that their energy content is close to or small compared to kT , whereby such film has super-paramagnetic properties.

15 4. The integrated circuit of claim 3, wherein the ferromagnetic film is selected from the group consisting essentially of:

Spin-on film made out of ferromagnetic particles in a high thermal stability polymer;

Evaporated multilayer films made out of repeated layers of Terbium and ferromagnetic particles; and

5 Deposition of ferromagnetic nano-particles.

5. The integrated circuit of claim 1, wherein the liner further comprises a first diffusion barrier between an outer surface of the liner and a dielectric layer in which the conductor is disposed and a second diffusion barrier disposed between an inner surface of the liner and the conductive line.

10 6. The integrated circuit of claim 5, wherein the diffusion barriers are Tantalum nitride/Tantalum.

7. The integrated circuit of claim 1 wherein the first surface is adjacent to a magnetic element.

8. The integrated circuit of claim 7 wherein the first surface is either a top or
15 bottom surface of the conductor.

9. The integrated circuit of claim 7 wherein the liner further comprises a first diffusion barrier between an outer surface of the liner and a dielectric layer in which the conductor is disposed and a second diffusion barrier disposed between an inner surface of the liner and the conductive line.

5 10. A method of fabricating an integrated circuit, the method comprising the steps of:

forming a conductor having first and second surfaces and sides; and
lining the second surface and sides with a magnetic liner having super-paramagnetic properties.

10 11. The method of fabricating an integrated circuit of claim 10, wherein the liner comprises a super-paramagnet with high susceptibility.

12. The method of fabricating an integrated circuit of claim 10, wherein the liner comprises a ferromagnet film with a microstructure having non-exchanged coupled micro domains whose size is so small that their energy content is close to or small compared to
15 kT , whereby such film has super-paramagnetic properties.

13. The method of fabricating an integrated circuit of claim 12, wherein the liner further comprises a first diffusion barrier between an outer surface of the liner and a

dielectric layer in which the conductor is disposed and a second diffusion barrier disposed between an inner surface of the liner and the conductive line.

14. The method of fabricating an integrated circuit of claim 13, wherein the diffusion barriers are Tantalum nitride/Tantalum.

5 15. An integrated circuit including an array of magnetic memory cells, wherein a memory cell comprises:

a magnetic element;

a first conductor located above the magnetic element and in magnetic communication thereto, the first conductor having first and second surfaces and sides, the
10 first side of the first conductor being adjacent to the magnetic element;

a second conductor located below the magnetic element in magnetic communication thereto, the second conductor having first and second surfaces and sides, the first side of the second conductor being adjacent to the magnetic element; and

15 a magnetic liner having super-paramagnetic properties lining the second surface and sides of at least one of the first and second conductors.

16. The integrated circuit of claim 15, wherein the liner comprises a super-paramagnet with high susceptibility.
16. The integrated circuit of claim 15, wherein the liner comprises a ferromagnet film with a microstructure having non-exchanged coupled micro domains whose size is
5 so small that their energy content is close to or small compared to kT , whereby such film has super-paramagnetic properties.
17. The integrated circuit of claim 16, wherein the liner further comprises a first diffusion barrier between an outer surface of the liner and a dielectric layer in which the conductor is disposed and a second diffusion barrier disposed between an inner surface of
10 the liner and the conductive line.
18. The integrated circuit of claim 17, wherein the diffusion barriers are Tantalum nitride/Tantalum.